



Ship Material Condition Metrics Model

Maintenance Figure Of Merit (MFOM) 2.0



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Agenda

- What MFOM Is
- Status
- What MFOM Provides
- Next Phase
- Determining Troubled Equipment



What is MFOM

- MFOM 2.0 is a computer based tool built on Hierarchical System Codes (HSC)
- Designed to consistently and objectively calculate a material condition readiness value for equipment, systems, tasks, missions or the ship.
 - MFOM resides on the classified and unclassified networks both ashore and afloat
 - MFOM is accessed through any internet connection
 - MFOM is modeled based on input from operational and technical Subject Matter Experts
 - MFOM takes into account redundancy and system interdependency

MFOM Provides for the Right Maintenance
at the Right Time for the Right Cost



What is MFOM

MFOM 2.0 Provides 3 Significant Tools

- **Material Readiness Reporting Tool for Ship Systems**
 - MFOM calculates and reports a percentage of readiness for shipboard equipment and systems based on the documented material condition
 - MFOM uses standard material reporting tools
- **Screening Tool for Maintenance Actions**
 - MFOM provides each maintenance action a numerical value based on the Equipment Operating Capability (EOC) and system impact
 - This allows for the prioritization of maintenance actions based on their contribution to material readiness
- **Material Readiness – Resources Tool**
 - MFOM provides the funding required to reach a certain level of material readiness based on the documented material condition



MFOM Defined

- MFOM takes input from
 - Automated Work Requests (i.e., 2 Kilos)
 - Inspections, Certifications, Assessments and Visits (ICAVs)
 - Alterations
 - Repair work
 - CASREPs, etc
 - Tagouts (eSOMS)
 - Machinery Monitoring Systems (e.g., ICAS)
 - IPARS
 - Class Maintenance Plans
 - Other Technical Documentation (DFS, UROs, IMMPS, Master Spec Catalog, MRCs)
- Ship's configuration data
 - All records for each hull from CDMD-OA



Operational Performance Values and Definition

Totally Inoperative: 0.0 - The system or equipment not capable of performing required functionality.
Example - when the power switch is turned on Nothing happens, no lights on the panel, nothing.

Inoperative: 0.2 or 0.1 - System or equipment not capable of performing intended functions using posted operating procedures

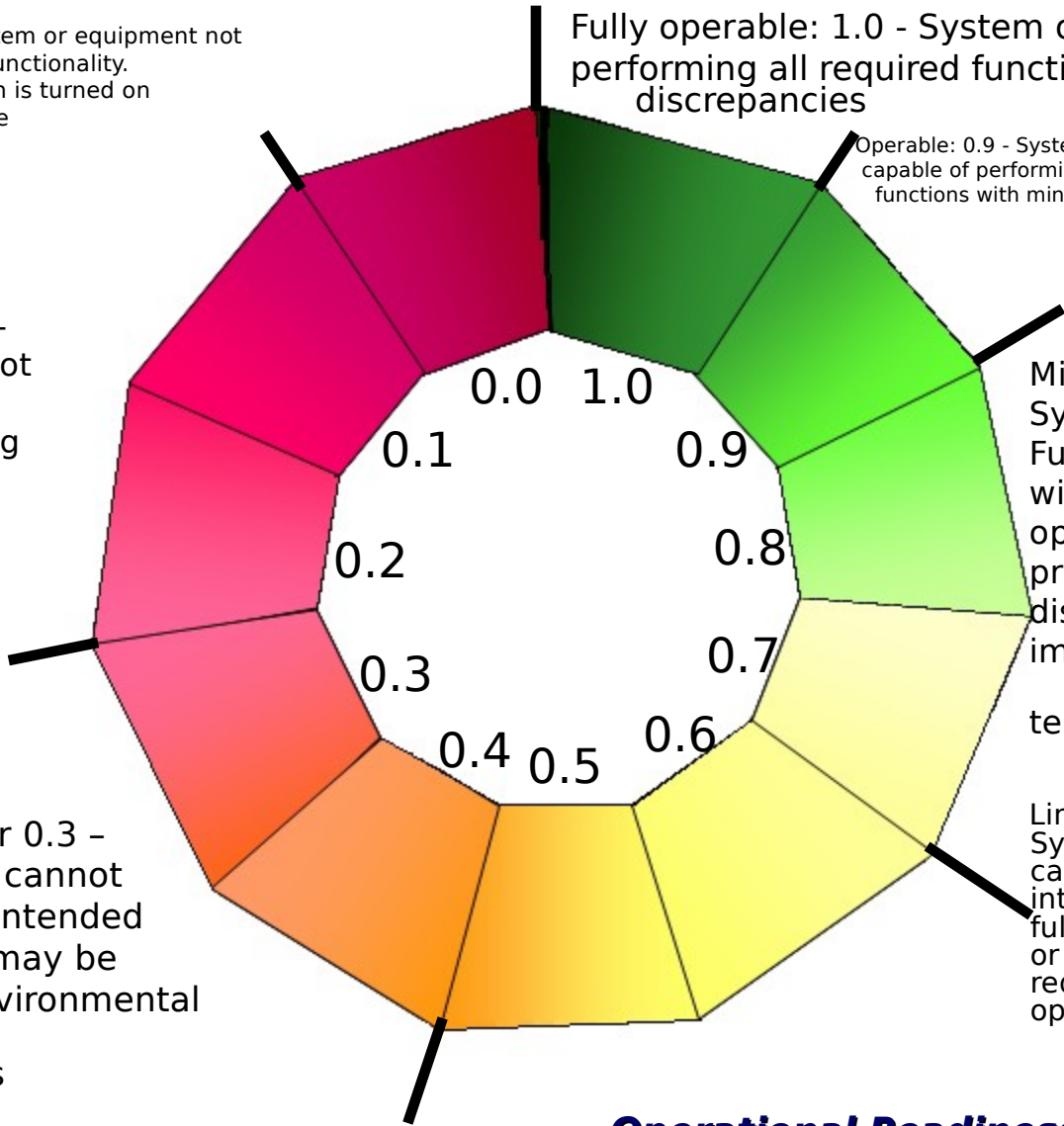
Major problems: 0.4 or 0.3 - System or equipment cannot perform one or more intended functions. Functions may be restricted by time, environmental or operational conditions

Fully operable: 1.0 - System or equipment capable of performing all required functions with only cosmetic discrepancies

Operable: 0.9 - System or equipment capable of performing all required functions with minor discrepancies

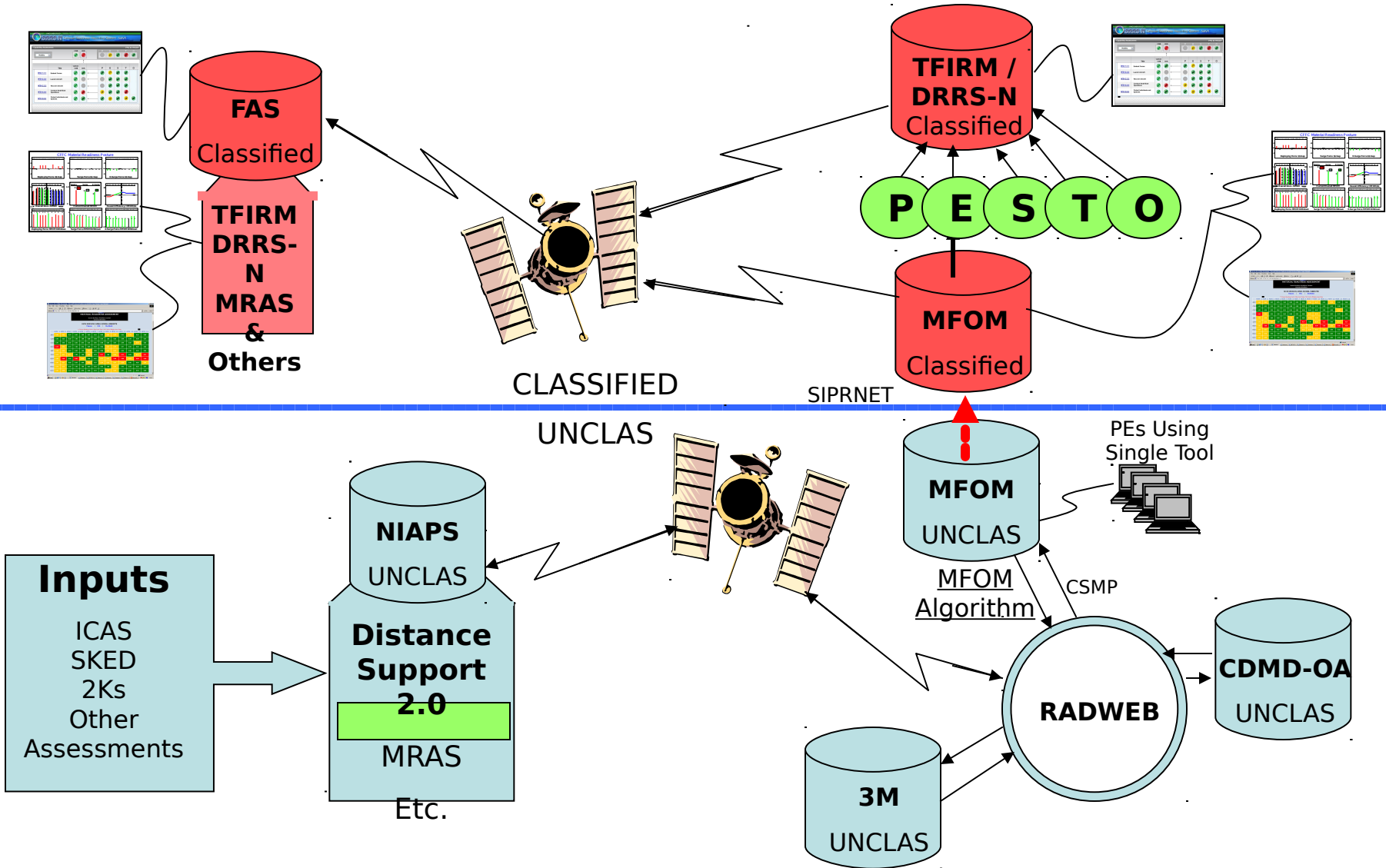
Minor problems: 0.8 or 0.7 System or equipment Functions when required without modification of operating instructions and procedures. Minor discrepancies are likely to impede function in the near term.

Limited capability: 0.6 or 0.5 - System or equipment is capable of performing intended functions, but not at full operational requirements, or not capable of performing required functions in all operating modes





Shipboard Metrics





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High Level Milestones

- **Surface Ships**
 - 140 Individual ships with material condition reporting now
 - TYCOM validations in-progress
- **Material Condition Input to TFIRM Ready**
 - All Surface Ships - 5 Jul 06
 - Carriers/Subs - 29 Sep 06
- **Classified Network**
 - Full operation Jul 06
 - Ability to pass data low-high Jul 06
 - Ability to pass data high-low 1 Oct 06
- **UNCLAS Network**
 - Full operation Aug 06
- **Validation, Screening and Brokering (MFOM 1.0 Shutdown)**
 - 1 Dec 06

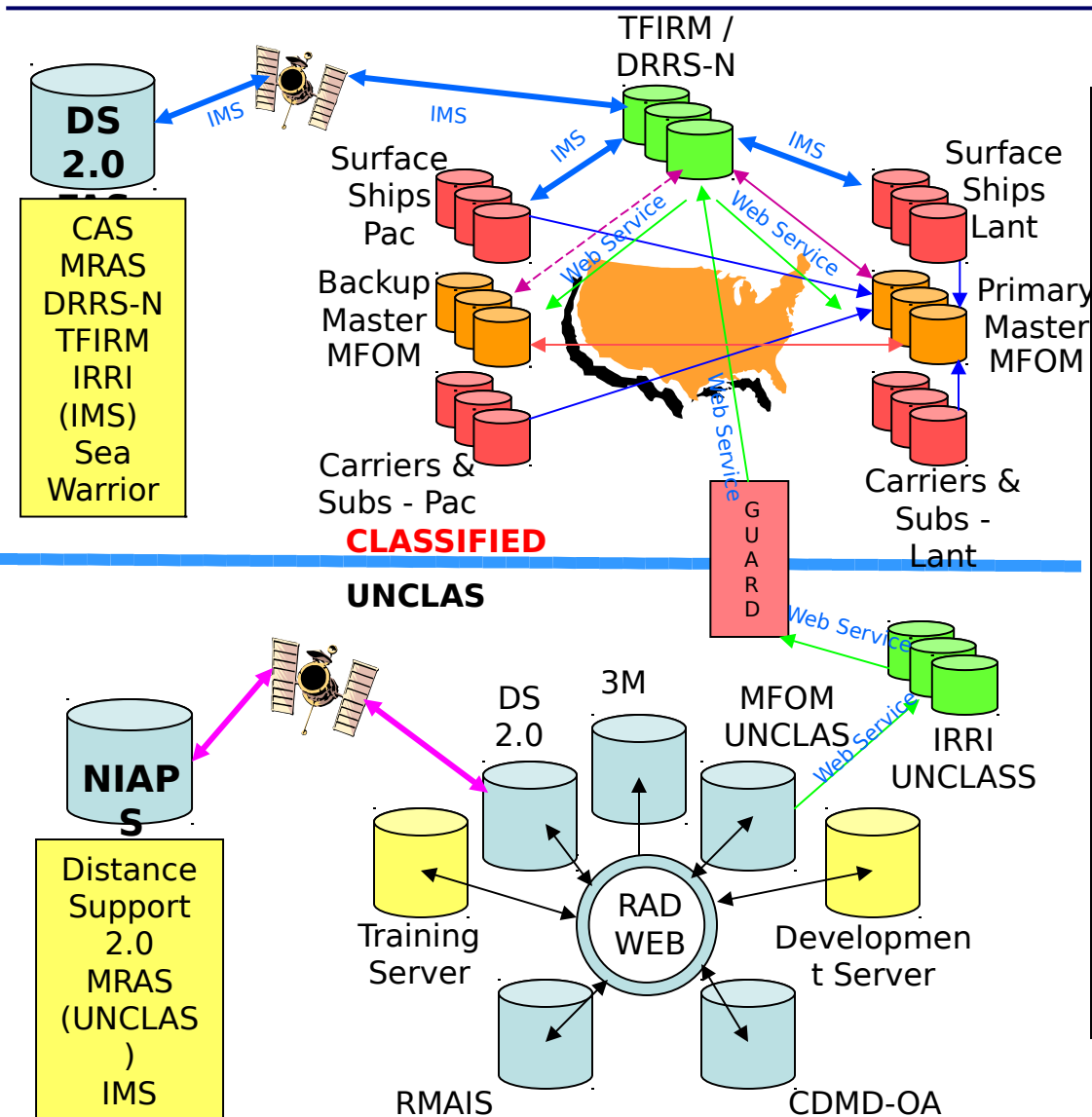


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Server Communications

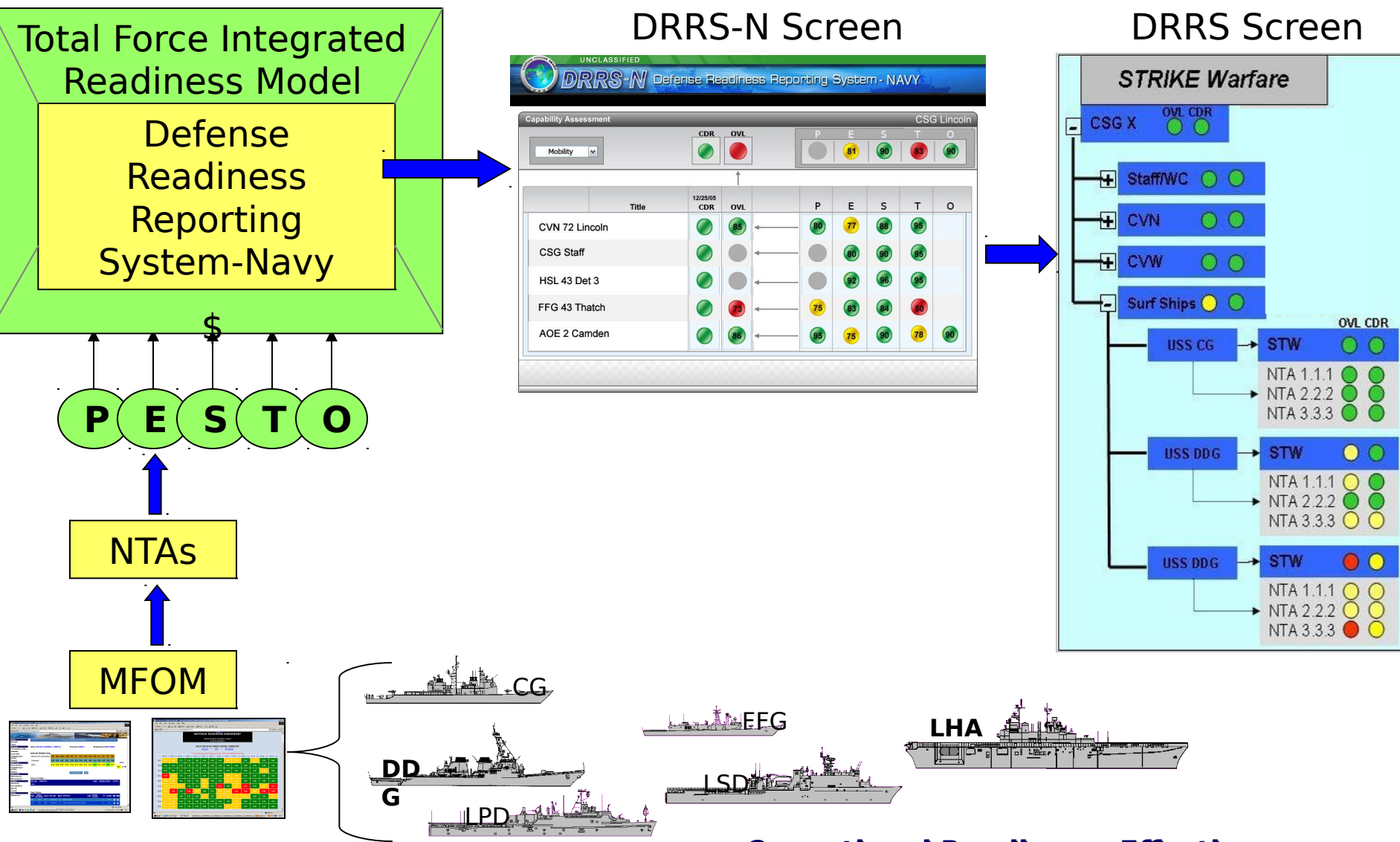


End State

- Ship uses Distance Support to send 2K information ashore
- Distance Support shore server sends data to RADWEB where MFOM pulls it
- MFOM (UNCLAS) shares data with all maintenance sites and provides validation, screening, & brokering
- Data transmitted through GUARD via IRRI to TFIRM and MFOM Classified
- MFOM Classified provides readiness metrics
- Metrics transmitted to TFIRM and ship
- MRAS (Classified) receives metrics from shore and provides MFOM functionality shipboard
- Ship able to see both MFOM and TFIRM / DRRS-N metrics on FAS



Feeding Other Metric Systems

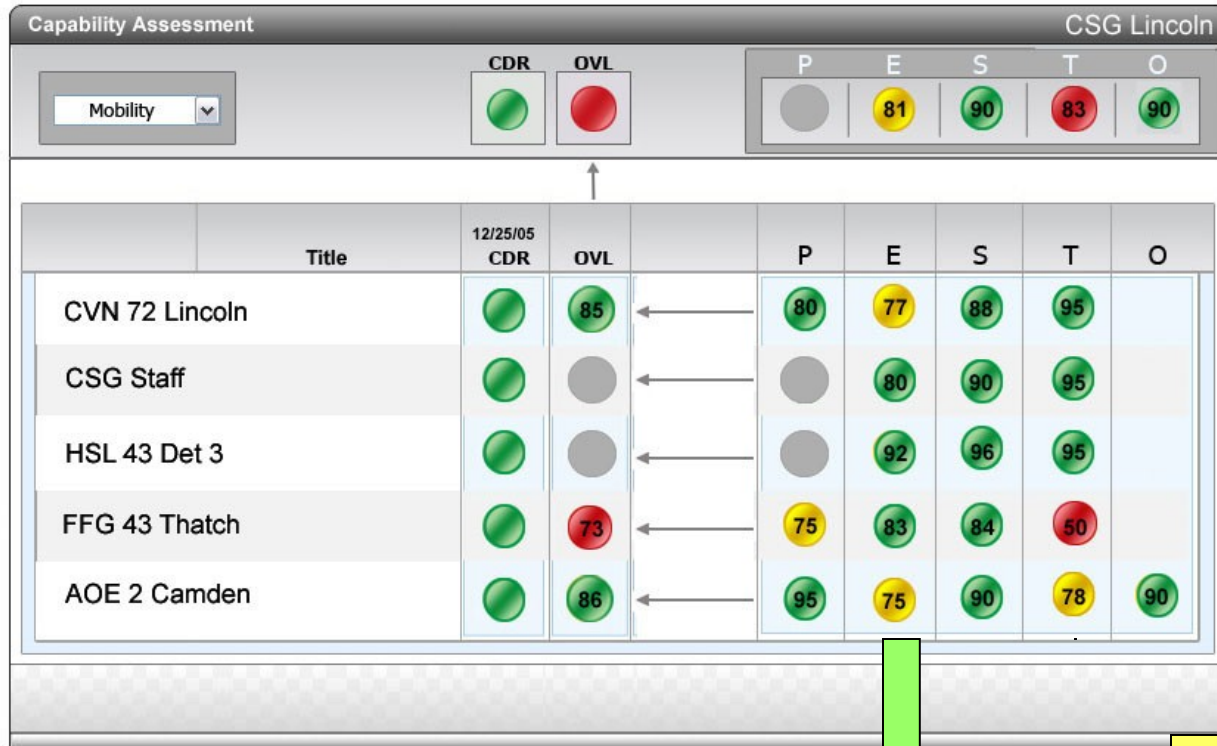




Capability Roll-up



UNCLASSIFIED

DRRS-N Defense Readiness Reporting System - NAVY

Drill Down Capability

- Clicking on Equipment Pillar bubble brings up top ten equipment items degrading this capability on a ship
- JSN, System Noun Name, CSMP Summary and ECD are displayed

JSN ECD	System Name	Summary	
EM02 3/09/06 2231	Chill Water Sys	#2 CWP Seal leaks	
EA01 1/15/06 1547	Anchor Windlass	Debris in lube oil	



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Use of Automated Systems for Material Condition

- MFOM use of other data systems to determine system/equipment availability
 - Technical Evaluations
 - IPARS – ISE analysis of monitored data with recommendations for follow-on maintenance actions
 - ICAS – raw data or meter readings provide monitored data
 - System Isolation / eSOMS – tagouts of systems or equipment making them unavailable
 - Planned Maintenance
 - PMS – completed items denote material condition
 - CMP – depot maintenance items
 - EDFS – Electronic Departure From Specifications



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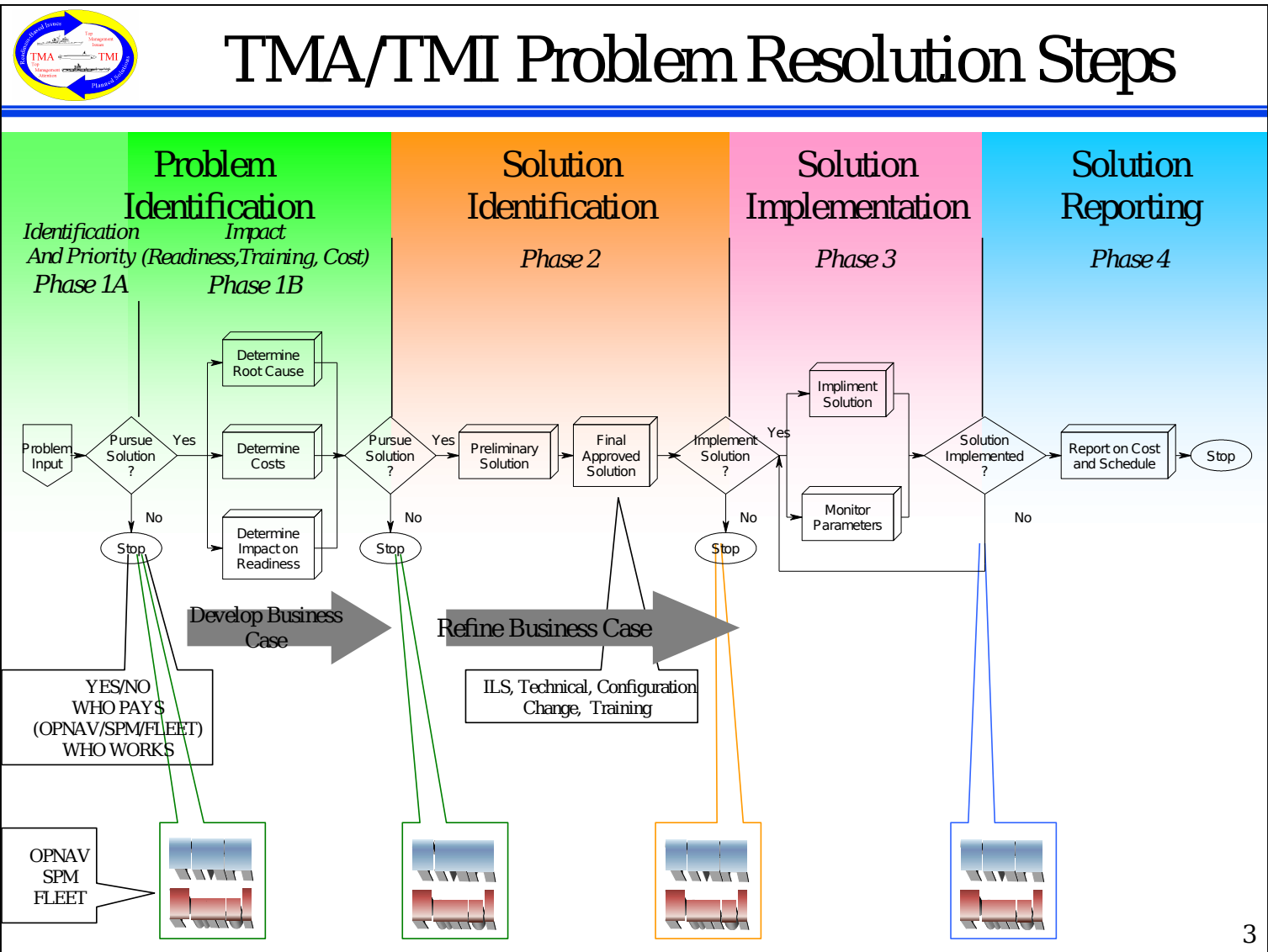


Use of MFOM to Discover System Problems

- MFOM provides:
 - Suggested work candidates to repair to improve material condition readiness
 - Validation, Screening and Brokering of work candidates
 - Improved data quality
 - For the first time ship's force will be able to visualize if a work candidate is written correctly in terms of impact and against the correct item
 - More detailed analysis down to specific work candidates
 - Equipment or system values across a class or classes
 - Fire pump, HPAC or A/C unit material condition values
 - This allows assessment in a whole new method
 - Ability to link what's important and in poor condition with costs
 - Resources to Readiness
- Other processes track need for an alteration
 - TMA/TMI
 - Tracks method of improvement (training, improved quality of workmanship or parts or eventually need for alteration)
 - SHIPMAIN
 - Tracks alteration implementation methodology once need for this type of improvement is needed

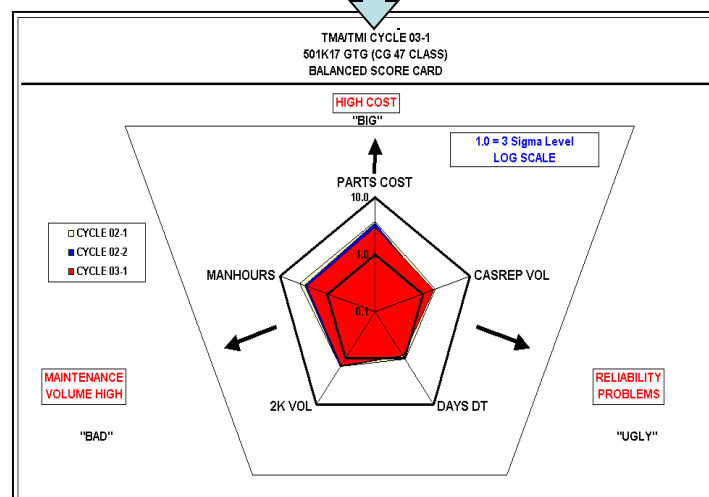
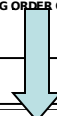
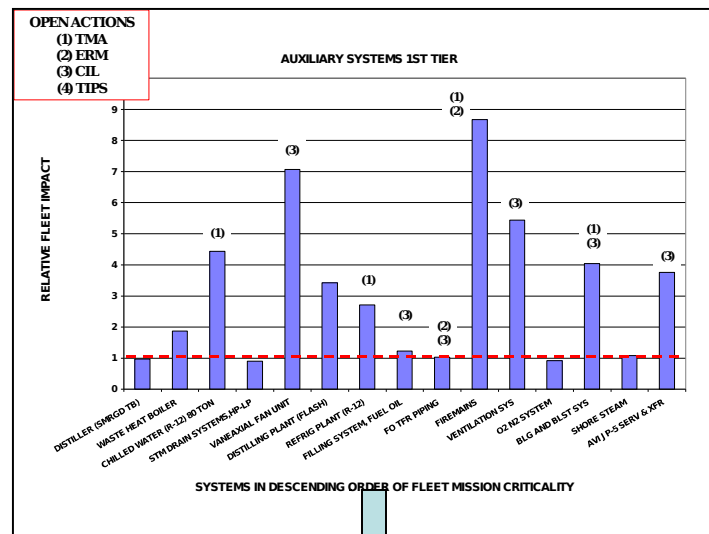
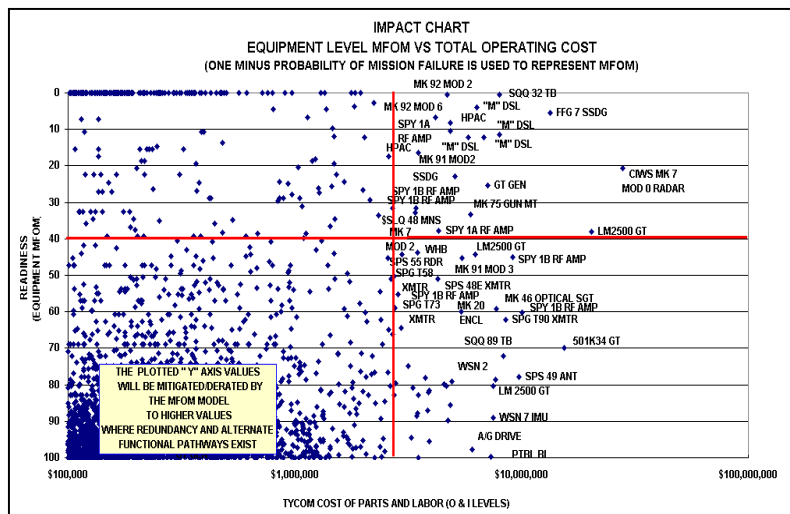


TMA/TMI Process





TMA/TMI Data Analysis



- Systems screened overall in first process
- Systems ranked in second process
- Systems investigated in third process
 - Parts Cost, CASREPs, Days Down Time, 2K Volume, & Man-hours



SHIPMAIN

- SHIPALTS

- Three Phase Approval
 - Idea
 - Demonstration/Trial
 - Fleet-wide implementation
- Board of O-6's decides if an Alt is worthy of implementation
 - Based on several factors including need, safety, ROI, capability etc.